

MOBILE ASTHMA ACTION PLAN FOR ADOLESCENT WITH ASTHMA

REISY TANE & HANY WIHARDJA

Student of Master Program, Faculty of Nursing, Universitas Indonesia

ABSTRACT

Asthma is the most common health problems in adolescents. Self-management is one way to improve health status in an adolescent with asthma. Mobile technology has the potential to improve self-management in adolescents with asthma. Objective: The aim of this study to determine the effectiveness of using the mobile technology Asthma Action Plan to improve self-management. Method: this study is Systematic review approach using PRISM template. The literature search started on first September 2017 by using electronic data Pro Quest and Google Scholars with keywords "Mobile AAP" AND "Adolescent Asthma". Results and Conclusion: M-AAP is effective to improve adolescent self-management with asthma because it is easy to use and provide information appropriately. The improvement of self-management in teenagers will improve the quality of life of adolescents with asthma. The recommendation of this study is the addition of parental control content in the application appropriate with Family Centered Care (FCC) philosophy on pediatric nursing. In addition, it is expected the development of applications for other chronic diseases such as diabetes mellitus and congestive heart failure.

KEYWORDS: Asthma, Mobile, AAP, Adolescent & Self-Management

Received: Feb 24, 2018; **Accepted:** Mar 14, 2018; **Published:** Mar 27, 2018; **Paper Id.:** IJMPSAPR20188

INTRODUCTION

Asthma is one of the global problems that can affect all age groups, especially in adolescents. According to the World Health Organization (WHO) the definition of asthma is a disease caused by inflammation of the airways resulting in airflow in and out of the lungs becomes obstructed¹(WHO, 2017). The prevalence of asthma in the world reaches 334 million people and have a high disability burden. According to The International Study of Asthma and Allergies in Childhood, the number of children and adolescents suffering from asthma is 14% of the world's population. In addition, the level of asthma is also most commonly experienced by groups of adolescents with age range 10 to 14 years (Kemenkes RI, 2013). In Indonesia based on the Basic Health Research report, the prevalence of asthma is 4.5% of the total population in Indonesia. The highest number of patients with asthma is in Central Sulawesi with the number of 7.8% with the incidence rate in adolescents of the age group of 15-24 as 5.6% of all people with asthma(WHO, 2014).

The negative impact of asthma is a decline in the quality of life in adolescents⁴. Almost all asthma symptoms significantly interfere with daily activities. Adolescent feel frustrated because they can't follow the activities of other teenagers, are often absent from school, and there is a disruption in daily physical activity (Cillessen, van de Ven, & Karremans, 2017). The negative effects of asthma can be overcome if adolescents improving self-management behavior to increase control of asthma. A total from 27 systematic review studies reveal the proper implementation of self-manage¹ment can reduce the length of hospitalization, the incidence of

¹The researcher is an awardee of Indonesian Endowment Fund for Education (LPDP). This research is supported by LPDP

accidents and other emergencies thereby improving the quality of life of adolescents with asthma (Vazquez-tello, 2017).

The most frequent problem in an adolescent with asthma is lack of long-term self-management (Hilary Pinnock et al., 2017). It will be affecting the adolescent condition because leads to complications (Braido, 2013). Previous studies stated that 50 adolescents found the experiencing anxiety associated with poor asthma control, impaired quality of life, insomnia and increased use of emergency health facilities for asthma (Voorend-Van Bergen et al., 2014).

Other factors affecting non-compliance with self-management are forgetfulness, adolescent rebellion against treatment, support and lack of knowledge about asthma action plans (Shams, Bruce, & Fitzpatrick, 2017). An important component of effective asthma self-management interventions is the provision of an asthma action plan (AAP) (Gandhi et al., 2013). National Heart, Lung, and Blood Institute has published a written action plan for asthma, but not all patients have access to a written action plan (AAP) at the time of recurrence of asthma (National Heart Lung and Blood Institute, 2012).

The advancement of mobile information technology can influence the delivery of health services to patients (H. Pinnock, 2015). Mobile technology has the potential to support self-management in adolescents with asthma. This happens because mobile phones and tablets have special software programs or applications that can be designed according to the needs of the patient. Mobile Asthma Action Plan (AAP) is an app designed specifically for an adolescent with asthma. The use of this application allows adaptive, responsive, confidential and distorted communication channels. The AAP application applies chunking principles consisting of writing, drawing, sound, and video (Al-Durra, Torio, & Cafazzo, 2015). The use of mobile AAP increases the utilization rate of asthma action plans because it raises awareness of asthma-related and then reduces the number of asthma relapse (Whitehead & Seaton, 2016).

METHOD

The method of this studies is using a systematic review approach with PRISMA template. The literature search began on September 1, 2017, by using electronic data. The PRISMA search strategy involved two electronic databases Pro Quest and Google Scholars with term "Mobile Asthma" AND "Adolescent". The criteria inclusion of articles are used the English language, the year of publication start 2013 till 2017 and the article must relevant with the topic of review. When the article not relevant to the topic will be eliminated.

Table 1: PICOS Search Strategy

	PRISMA
Population	Adolescent with asthma
Intervention	Mobile technology self-management intervention
Comparator	Intense self-management
Outcomes	Adherence, improving self-management, quality of life
Settings	Any health care setting, homecare setting
Study design	All of study design are included in this review
Dates	Database search start January 2013 to August 2017
Data bases	ProQuest and Google Scholars
Manual searching	Journal of asthma, self-management in adolescent with asthma, mobile application for asthma
Forward Citations	Bibliographies eligible reviews
In progress studies	Abstracts were used to identify recently published trials
Other exclusions	Paper not publish in English and not relevant with study

Search strategy in this studies consist of 4 steps; 1) Screening process from abstract; 2) Screening for inclusion

criteria; 3) Removal duplicates; 4) Independent review.

RESULTS

Study Selection

The search process is outlined in the flow diagram (Figure 1). The total article from two databases 12501 articles matched the prior search terms and was reviewed by the primary reviewer based on the title. The next step is only 7101 article matched with the years. Then we selected articles by abstract 4308 and eliminated the duplicate. In the last step, the remaining articles are only 9 articles for analyzing. The characteristic of the article in this studies is come from various country 6 articles from the USA, 2 Arkansas, and 1 Florida. The sample in this studies consisted of adolescents, parents and both. the number of articles that only examine teenagers is 7, parents 1 and 1 both. In addition, the articles using the design consist of 6 RCT, 2 descriptive and survey, and 1 correlation.



Figure 1: Flow Diagram of Search Process

Effectivity of Asthma Control

The Mobile Asthma Action Plan was formed based on an action plan but has undergone several revision processes. based on the review of articles on the development of mobile applications can increase the control of asthma. Three article stated that one of the articles compares the using of a written asthma action plan with mobile apps. the result is adolescent often using mobile application than written plans. In addition, the user of mobile app also increased the asthma control in the intervention group of adolescent (before, 11, after, 20) ($P = .04$) compared with no change in the paper group (before, 17, after, 17) ($P = .64$) (Burbank et al., 2015).

Other studies conducted in the United States against 19 adolescents mentioned that receiving asthma or Asthma messages will improve awareness of symptoms and triggers, promoted treatment of adherence and sense of control, and facilitated adolescent-parent partnerships. Adolescents utilized the mobile AAP a median 4.3 days/week (Perry et al., 2017). For participants with uncontrolled asthma at baseline, median (interquartile range) ACT scores improved significantly from 16 (5) to 18 (8) [$p = 0.03$]. Median asthma attack prevention self-efficacy scores improved from 34 (3.5) to 36 (5.3) [$p = 0.04$] (Rhee, Allen, Mammen, & Swift, 2014).

The use of mobile electronic applications decreases asthma symptoms and daily use of inhalers with an average of 70%. The EMA-measured adherence to rescue is ACT ($r = -0.33$, $P = .034$) (Burbank et al., 2015).

Satisfaction with Mobile Application

Three articles reviewed explain teenagers feel satisfied with the use of mobile applications asthma. An adolescent who uses the application expressed satisfaction by stating they will suggest the AAP smartphone to a friend 100%. Participants' satisfaction with 93% stated that they were better able to control asthma by using AAP phones. All survey participants agree with an easy-to-use application, can be used without written training, and are designed for adolescents with asthma with severity (Mulvaney et al., 2013). These patients and providers strongly support this application will help provide information about what to do when an asthma exacerbation and its application is often used (Shaw, Daratha, Odom-Maryon, & Bindler, 2013).

The Need to Add App Content

The results found that two studies mentioned the need to add content to the application. The first article stated that theoretical thematic analysis resulted in a set of personal needs, feature ideas, and app of the relevant features by young people for an asthma support app. The data mentioned that psychological factors such as anxiety, and impediments to autonomy, competence, and relatedness (as consistent with self-determination theory [SDT]), were considered major influences on quality of life by young people with asthma (Peters et al., 2017).

Another article specifies that the application framework image is generally well received, and some suggestions for improvement are noted. Suggestions include improved graphics adjustments and notifications, reminders and warnings. Participants chose longitudinal data about asthma control and drug use to be displayed using a line graph (Sage et al., n.d.).

Legal Aspect of Application

The mobile application also has privacy account for a patient, the data is sent securely through the database and each patient individually selects the password required to access the application. The patient has their own id and password so that it cannot be accessed by others. The existence of data confidentiality is in line with the ethical principles of confidentiality where a nurse is obliged to keep patient data to others.

The Application is using the principle of autonomy because when the nurse will access the data must have permission from the patient. Applications that have the terms and conditions known to the patient's personal health information are useful can be seen in the patient's application. Patients can enter and exit to the app as desired. This is a risk because if at any time the phone is lost because the information can be accessed by others (Kosse, Kaptein, Geers, & Dijk, 2017).

DISCUSSIONS

Patient adherence with self-management is an active and continuous process requiring long-term promotional strategies. One of the interventions is by using technological advances in the health sector, especially for management of long-term diseases such as asthma. Technological Advancement provides an appropriate, and easily understood, and self-management education (Eakin & Rand, 2012). Mobile technology is one of technological advance. Mobile technology can provide an appropriate method because it can appropriately assess asthma symptoms. Adolescent use the mobile app or an asthma action plan (AAP) is able to survive properly so that beneficial for asthma sufferers and health providers. A survey conducted on adolescents aged 12-19 years with 94% results stated that M-AAP application is easy to use without any written instructions again (Odom, Assistant, Christenbery, & Associate, 2016).

The benefits of M-AAP for an adolescent is already available on smartphone apps and the format of the app is easier. The application gives Important information and meaning. When asthma attack comes adolescent can easily access M-AAP. Therefore, an adolescent who has asthma believe the use of mobile asthma action plan application is easier than writting. One study explains the comparison of AAP mobile usage with AAP. The results of a study of 34 adolescent with asthma control and self-efficacy tests showed that the number of adolescents in the adolescent group using smartphones experienced increasing control of asthma from 11 to 20 ($P = 0.4$) higher than written AAP. In addition to increasing control of asthma, the use of AAP applications from smartphone also increases adolescents' satisfaction by 100%(Perry et al., 2017).

Another study conducted to adolescents who use mobile AAP for 4.3 days/week the results is high satisfaction in adolescents is 93%. An adolescent who using of mobile AAP more able to control asthma. Other significant things can also be seen from the control of asthma ($p = 0.03$) revealed adolescents may increase control of asthma by using AAP mobile. Several studies about mobile AAP it can be concluded that M-AAP is the right method for communicating the asthma action plan instruction in adolescents. In addition to providing convenience to teenagers with asthma mobile asthma Action Plan also provides precise information about the treatment that can be used at the time of asthma attacks thereby reducing the risk of medical problems.

The AAP mobile app requires the provider that the health care provider determines the appropriate medication in the asthma action plan and subsequently the implementing nurse will guide the patient through treatment programs and in-app instructions. This process ensures the patient gets the correct information related to asthma. Healthcare providers have access to patient data and obtain information on web portals so they can track whether the patient is in an emergency or not while using the application. Mobile-based applications conform to social cognitive theory (SCT) or cognitive social theory. SCT is the model of behavior selected for. Actions on asthma are based on the uniqueness of the application of education on the management of chronic diseases. SCT theory emphasizes the influence of self and environment on behavior. In cognitive social theory, the patient is expected to learn through observation. Learning with SCT uses an application consisting of text, images, and video that demonstrates directly for asthma management(Burbank et al., 2015).

CONCLUSIONS

Mobile technology intervention is one of the alternatives used in health services. One of the mobile technologies is the application of an asthma action plan or AAP that can be used to perform self-management for persistent asthma sufferers. Mobile asthma action plan consists of detection of recurrence of asthma, medication, asthma trigger distraction using writing, drawing and equipped with a video that appeals to adolescent. M-AAP can improve adolescent self-management because of behavioral changes according to cognitive social theory. The use of M-AAP is very effective in improving self-management because it can reduce the recurrence and complications of asthma so that adolescents can activate as usual and improve the quality of life. Recommendation for further research is the need for application of the application to other chronic diseases.

ACKNOWLEDGMENT

I would like to thank the father and lecturer of the information management system course that has provided guidance for this article. Besides that I would like to thank the Indonesian Endowment Fund for Education (LPDP), Ministry of Finance which has provided support for the publication of this article

REFERENCES

1. Al-Durra, M., Torio, M.-B., & Cafazzo, J. A. (2015). *The Use of Behavior Change Theory in Internet-Based Asthma Self-Management Interventions: A Systematic Review*. *Journal of Medical Internet Research*, 17(4), e89. <https://doi.org/10.2196/jmir.4110>
2. Braido, F. (2013). *Failure in Asthma Control: Reasons and Consequences*. *Scientifica*, 2013, 1–15. <https://doi.org/10.1155/2013/549252>
3. Burbank, A. J., Lewis, S. D., Hewes, M., Schellhase, D. E., Rettiganti, M., Hall-Barrow, J., ... Perry, T. T. (2015). *Mobile-based asthma action plans for adolescents*. *Journal of Asthma*, 52(6), 583–586. <https://doi.org/10.3109/02770903.2014.995307>
4. Cillessen, L., van de Ven, M. O., & Karremans, J. C. (2017). *The role of trait mindfulness in quality of life and asthma control among adolescents with asthma*. *Journal of Psychosomatic Research*, 99, 143–148. <https://doi.org/10.1016/j.jpsychores.2017.06.014>
5. Eakin, M. N., & Rand, C. S. (2012). *Improving patient adherence with asthma self-management practices: What works?* *Annals of Allergy, Asthma and Immunology*. <https://doi.org/10.1016/j.anai.2012.06.009>
6. Gandhi, P. K., Kenzik, K. M., Thompson, L. A., DeWalt, D. A., Revicki, D. A., Shenkman, E. A., & Huang, I.-C. (2013). *Exploring factors influencing asthma control and asthma-specific health-related quality of life among children*. *Respiratory Research*, 14(1), 26. <https://doi.org/10.1186/1465-9921-14-26>
7. Kemenkes RI. (2013). *Riset Kesehatan Dasar (RISKESDAS). Laporan Nasional 2013*. <https://doi.org/10.1186/1465-9921-14-26>
8. Kosse, R. C., Kaptein, A. A., Geers, C. J., & Dijk, L. Van. (2017). *mHealth intervention to support asthma self- management in adolescents : the ADAPT study*, 571–577.
9. Mulvaney, S. A., Ho, Y. X., Cala, C. M., Chen, Q., Nian, H., Patterson, B. L., & Johnson, K. B. (2013). *Assessing adolescent asthma symptoms and adherence using mobile phones*. *Journal of Medical Internet Research*, 15(7). <https://doi.org/10.2196/jmir.2413>
10. National Heart Lung and Blood Institute. (2012). *Asthma Care Quick Reference: Diagnosing and Managing Asthma*. *Asthma Care Quick Reference*, 11.
11. Network, G. A. (2014). *The Global Asthma Report Asthma may affect as many as*.
12. Odom, L., Assistant, F. C., Christenbery, T., & Associate, C. N. E. (2016). *There is an “ app ” for that : Designing mobile phone technology to improve asthma action plan use in adolescent patients*, 28, 583–590. <https://doi.org/10.1002/2327-6924.12375>
13. Perry, T. T., Marshall, A., Berlinski, A., Rettiganti, M., Brown, R. H., Randle, S. M., ... Bian, J. (2017). *Smartphone-based vs paper-based asthma action plans for adolescents*. *Annals of Allergy, Asthma and Immunology*, 118(3), 298–303. <https://doi.org/10.1016/j.anai.2016.11.028>
14. Peters, D., Davis, S., Calvo, R. A., Sawyer, S. M., Smith, L., & Foster, J. M. (2017). *Young people’s preferences for an asthma self-management app highlight psychological needs: A participatory study*. *Journal of Medical Internet Research*, 19(4). <https://doi.org/10.2196/jmir.6994>
15. Pinnock, H. (2015). *Supported self-management for asthma*. *Breathe*, 11(2), 98–109. <https://doi.org/10.1183/20734735.015614>

16. Pinnock, H., Parke, H. L., Panagioti, M., Daines, L., Pearce, G., Epiphaniou, E., ... Taylor, S. J. C. (2017). Systematic meta-review of supported self- management for asthma : a healthcare perspective. *BMC Medicine*. <https://doi.org/10.1186/s12916-017-0823-7>
17. Rhee, H., Allen, J., Mammen, J., & Swift, M. (2014). Mobile phone-based asthma self-management aid for adolescents (mASMAA): A feasibility study. *Patient Preference and Adherence*, 8, 63–72. <https://doi.org/10.2147/PPA.S53504>
18. Sage, A., Roberts, C., Geryk, L., Sleath, B., Tate, D., Carpenter, D., & Sage, A. (n.d.). A Self-Regulation Theory – Based Asthma Management Mobile App for Adolescents: A Usability Assessment Corresponding Author :, 4. <https://doi.org/10.2196/humanfactors.7133>
19. Shams, M. R., Bruce, A. C., & Fitzpatrick, A. M. (2017). Anxiety Contributes to Poorer Asthma Outcomes in Inner-City Black Adolescents. *The Journal of Allergy and Clinical Immunology: In Practice*, 1–9. <https://doi.org/10.1016/j.jaip.2017.06.034>
20. Shaw, M. R., Daratha, K. B., Odom-Maryon, T., & Bindler, R. C. (2013). Pediatric patients with asthma: a high-risk population for subsequent hospitalization. *The Journal of Asthma : Official Journal of the Association for the Care of Asthma*, 50(6), 548–54. <https://doi.org/10.3109/02770903.2013.790414>
21. Vazquez-tello, A. (2017). *Impact of Asthma on the Quality of Life of Adolescent Patients from Saudi Arabia*, (January 2016). <https://doi.org/10.4172/2472-1018.1000114>
22. Voorend-Van Bergen, S., Vaessen-Verberne, A. A., Landstra, A. M., Brackel, H. J., Van Den Berg, N. J., Caudri, D., ... Pijnenburg, M. W. (2014). Monitoring childhood asthma: Web-based diaries and the asthma control test. *Journal of Allergy and Clinical Immunology*, 133(6). <https://doi.org/10.1016/j.jaci.2013.10.005>
23. Whitehead, L., & Seaton, P. (2016). The effectiveness of self-management mobile phone and tablet apps in long-term condition management: A systematic review. *Journal of Medical Internet Research*. <https://doi.org/10.2196/jmir.4883>
24. WHO. No Title (2017). Retrieved from <http://www.who.int/mediacentre/factsheets/fs307/en/>

